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³
ECONOMIC AND
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CHARACTERISTICS OF

ARIZONA

AND

NEW MEXICO

RANGE CATTLE RANCHES ^{TL}

7(U.S. DEPARTMENT OF AGRICULTURE,
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ECONOMIC AND OPERATIONAL CHARACTERISTICS OF ARIZONA AND
NEW MEXICO RANGE CATTLE RANCHES

3a
By

Calvin C. Boykin, Douglas D. Caton, and Lynn Rader^{1/}

INTRODUCTION

New Mexico and Arizona are widely known for range cattle operations and the production of feeder and stocker calves. In 1959, 21 percent of all farms in New Mexico and Arizona were livestock ranches. These ranches contained over 88 percent of the land in farms (table 1). Over 64 percent of the 2 million head of cattle and calves in New Mexico and Arizona in 1959 were located on range cattle ranches. The value of cattle and calves sold in that year from farms and ranches in these two States amounted to almost \$226 million. These sales comprised about 80 percent of the total value of all livestock and livestock products sold in these States, and 38 percent of all crops and livestock sold during this period.

In 1959 the average ranch in New Mexico and Arizona was 10,320 acres (exclusive of public land), with an average investment per ranch in land and buildings of \$140,906, and an average of \$12,705 in livestock (table 2). Average gross sales per ranch amounted to \$22,651.

Many ranchers in New Mexico and Arizona use public land under grazing permits. The majority of these permits are issued by the Forest Service and the Bureau of Land Management. The Federal ranges are grazed under regulations as to seasons of use, number of livestock, and the grazing period. Federal grazing land amounts to about 39 percent of the total land in the two-State area.

There is great variation in types of range in Arizona and New Mexico, also in types and sizes of cattle ranch operations. Incomes among ranches vary because of differences in productivity of range types, and because of differences in organization and costs. Annual variations in ranch income are due to variations in livestock prices and trends in costs and range conditions.

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Table 1.--Number of ranches, percentage these ranches are of all farms, land in these ranches as a percentage of all land in farms and of land not in Federal ownership, percentage of all land in Federal ownership, Arizona and New Mexico, 1955 and 1959

State	Number of ranches <u>1/</u>	Ranches as a percentage of all farms <u>1/</u>	Land in ranches as a--		Percentage of all land in Federal ownership <u>2/</u>
			Percentage of all land in farms <u>1/</u>	Percentage of all land not in Federal ownership <u>1/</u>	
	<u>Number</u>	<u>Percent</u>	<u>Percent</u>	<u>Percent</u>	<u>Percent</u>
Arizona-----	1,156	16.0	84.9	62.3	44.5
New Mexico---	3,771	23.8	90.2	58.4	33.7
Total---	4,927	21.4	88.4	60.4	38.9

1/ From: Farms and Farm Characteristics by Type of Farm, Census of Agriculture, table 19, 1959.

2/ Wooten, H. H., and Anderson, J. R. Major Uses of Land in the United States, Summary for 1954. U.S. Dept. Agr., Agr. Inform. Bul. 168, table 31, Jan. 1957.

Table 2.--Average acreage, average value, and average gross sales per range livestock ranch, Arizona and New Mexico, 1959

State	Acreage of private land	Value of land and buildings	Value of livestock	Gross sales per ranch
	<u>Acres</u>	<u>Dollars</u>	<u>Dollars</u>	<u>Dollars</u>
Arizona-----	13,907	241,089	20,019	32,730
New Mexico-----	9,220	110,195	10,463	19,561
Average-----	10,320	140,906	12,705	22,651

Source: Type of Farm Report, Census of Agriculture, 1959, tables 12, 57-59.

DESCRIPTION OF THE STUDY AREA

The areas in New Mexico and Arizona include the Southern Intermountain Ranching Area and the Southern Desert Ranching Area (fig. 1). These ranching areas consist of broad plateaus and benchlands, mesas, foothills, and mountain ranges. Average annual precipitation is from less than 10 inches at the lower elevations to 30 or 40 inches in the mountains. Most of the precipitation occurs as rainfall in late spring and early summer. This is also the period of maximum growth of range forage. Range forage growth varies considerably from location to location within each area because of differences in soils, temperature, and rainfall. The ranges in the Southern Desert Ranching Area are generally less productive than those in the Intermountain Area; the Desert Area also has lower annual rainfall and higher average temperature.

The number of Federal grazing permits^{2/} and the number of cattle grazed on Forest Service and Bureau of Land Management lands in the Southern Intermountain and Southern Desert Ranching Areas in the study period are listed in table 3. Many of these permittees have small operations; in 1960 over 60 percent of the permittees in each ranching area operated with fewer than 200 head of cattle (fig. 2).

OBJECTIVES

The objectives of this report are: (1) To present the cost, income, and investment of typical ranches in the Southern Intermountain and Southern Desert Ranching Areas as of 1960, and (2) to evaluate the effect of changes in costs, prices, and range forage supplies on the net income of these ranches.

ASSUMPTIONS AND BUDGET TECHNIQUE

The investment, cost, and ranch organizational data used in developing representative ranch budgets were obtained from interviews with about 140 ranchers in the two ranching areas. These data were supplemented with additional data from other research, and from Forest Service and Bureau of Land Management records. Representative ranch budgets were developed for cattle ranches holding both a Forest Service and a Bureau of Land Management permit, and for cattle ranches with either a Forest Service or a Bureau of Land Management permit. A total of 14 ranches were budgeted for the two ranching areas.

The investment in the representative ranches is based on 1960 market values. The market value includes whatever capitalized value the market has ascribed to grazing privileges. Investment in land is derived by subtracting the computed investment in buildings, equipment, and livestock from the estimated total value of the ranch. Buildings and equipment investments are 1960 replacement costs depreciated by 50 percent; livestock investment is January 1 livestock inventory at projected

^{2/} The National Forest ranges in the Southern Intermountain and Southern Desert Ranching Areas are grazed primarily in the summer, although some yearlong grazing is practiced on ranges at the lower elevations. The Bureau of Land Management ranges are primarily grazed yearlong, although fall-winter-spring grazing also is common in the northern section of the Southern Intermountain Ranching Area.

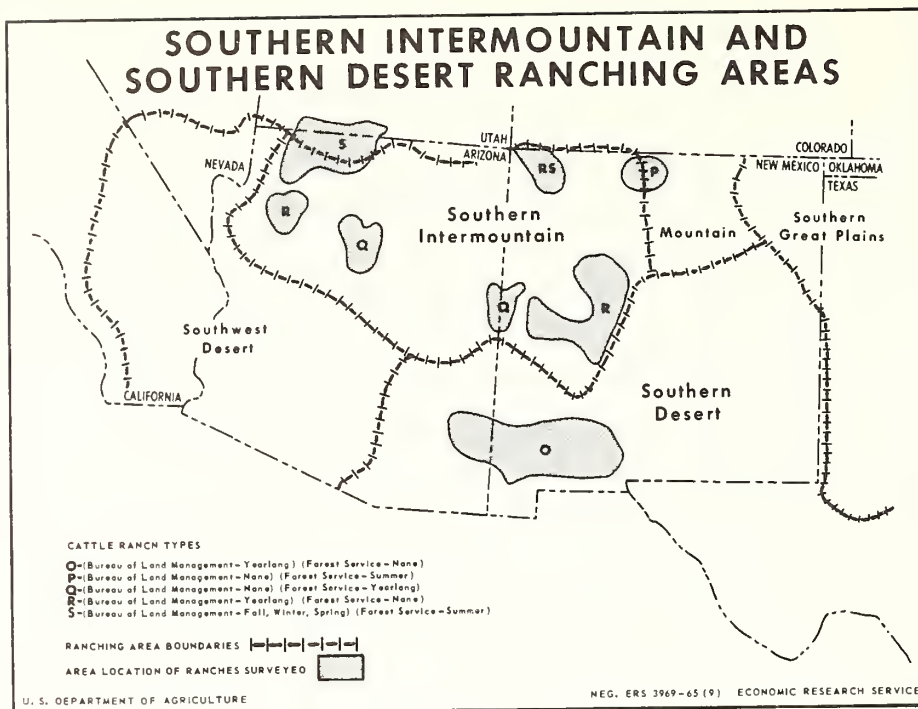


Figure 1

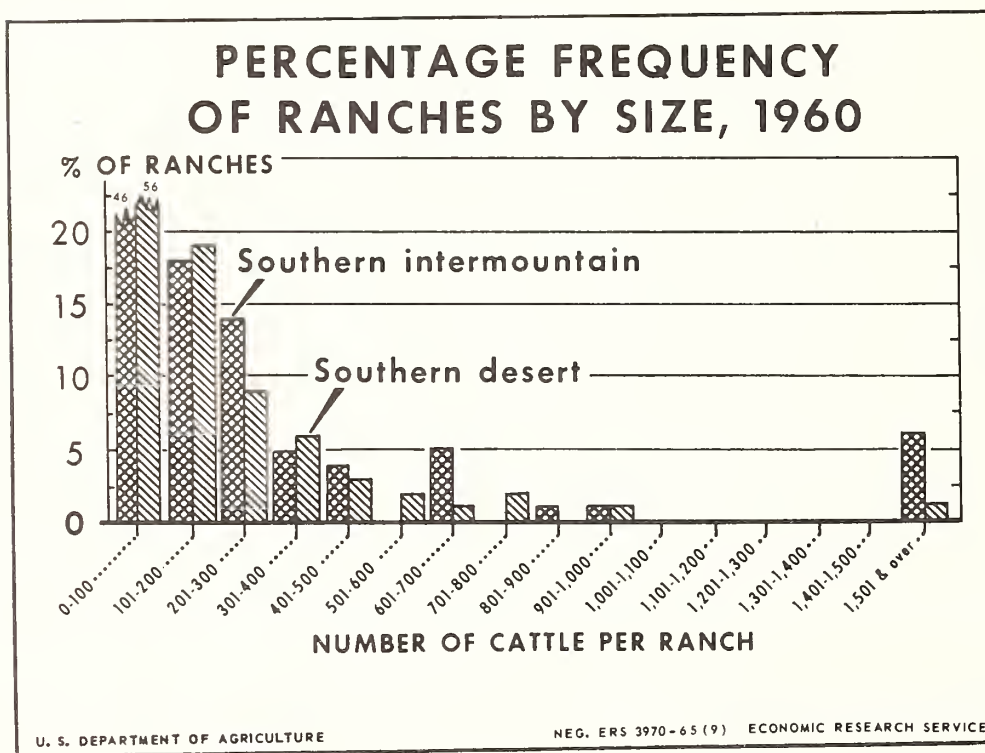


Figure 2

Table 3.--Cattle grazing permits issued by Bureau of Land Management and by Forest Service in 2 Southwest ranching areas, 1960

Item	Forest Service 1/	Bureau of Land Management 2/
	<u>Number</u>	<u>Number</u>
<u>Southern Intermountain Area</u>		
Total number of permits-----	2,155	1,253
Cattle permitted to graze-----	184,948	106,265
<u>Southern Desert Area</u>		
Total number of permits-----	461	3,623
Cattle permitted to graze-----	49,303	189,228

1/ Includes horses.

2/ Includes permits on both Section 3 and Section 15 lands.

market prices. The family home is excluded from ranch investment; depreciation and repair costs on the home are excluded from annual ranch expenses. Production costs of the representative ranches reflect 1960 prices paid in each ranching area. Only the estimated ranch business share of telephone, utility, and automobile costs is included in the budgets. Interest on operating capital is charged at an annual rate of 6 percent for 6 months. Labor use on the representative ranches is the normal amount of labor for each size and type of ranch included in the survey, which means that small ranches used less than a full-time man equivalent. Hired labor is paid at the local 1960 wage rate, operator labor is charged at the rate of a full-time hired man, and family labor is charged at equivalent hourly wage rates.

The projected U. S. prices used in the budgets were developed by the Farm Production Economics Division, U. S. Department of Agriculture, for use in this and other research studies. Comparable projected prices were developed for the Omaha livestock market for cattle. The price projections based on this livestock market were adjusted to each ranching area by relating the projected prices on the base markets to 1953-60 average prices at a centrally located market for each ranching area. The cattle prices thus obtained were then adjusted to each ranch locality by subtracting an allowance for marketing and transportation charges. Required monthly and seasonal cattle prices were determined by relating the 1953-60 average monthly prices to the 1953-60 average annual price. The marketing practices and time of marketing for each ranch were the typical patterns for ranches of the type budgeted in each locality. In addition to the estimates of receipts based on projected prices, 1953-60 average cattle prices were also used to show the effect of a price change on net ranch income.

The animal unit months of feed required by livestock for each representative ranch budget were based on feed standards expressed in the following animal unit equivalents: Mature cows, 0.91; yearling steers, 0.68; yearling heifers, 0.67; bulls, 1.20; calves, 0.51; and horses, 1.00.

CHARACTERISTICS OF REPRESENTATIVE RANCHES

Both cow-calf and cow-calf-yearling operations are included in the representative ranch budgets. The smaller cattle ranches are predominantly of the former type and the larger cattle ranches are mainly of the latter. Mature cows and replacement heifers average about 74 percent of livestock inventory numbers (table 4). The percent of yearling steers in each ranch inventory increases as ranch size increases.

The dependency of the representative ranches on Federal range forage varies from 27 to 93 percent of the annual feed requirement (table 5). The dependency is lowest for ranches with seasonal grazing permits, and highest for ranches with year-long grazing permits. The animal unit months of grazing obtained from Federal range of the representative ranches varies from 120 to 5,724 animal unit months.

The relationships which apparently affect the acreage of owned land are permitted animal unit months of grazing, carrying capacities, and cropland and pasture acreages. Ranches located at higher elevations require fewer acres of range and pasture per animal unit. For example, Forest Service permit ranches have 0.4 acres of cropland and pasture and 4.9 acres of rangeland per animal unit, as compared with no cropland and pasture and 32.6 acres of rangeland per animal unit for the cattle ranches

Table 4.--Livestock inventory, representative cattle ranches, Southern Intermountain and Southern Desert Ranching Areas, January 1, 1960

Ranching area		Southern Intermountain										Southern Desert			
Grazing permit type 1/		(BLM-0)	(FS-S)	(BLM-0)	(FS-Y)	(BLM-Y)	(FS-0)	(BLM-FWSp)	(FS-S)	(BLM-Y)	(FS-0)				
Ranch size in animal units 2/		35	125	118	240	512	35	247	471	34	210	337	68	182	423
		No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.
Cows:															
Mature-----		22	73	72	145	300	24	175	296	22	140	210	50	120	256
2-year heifers-----		3	12	8	20	40	4	21	56	3	20	32	5	16	56
Yearlings:															
Heifers-----		4	13	17	38	68	4	24	56	3	21	35	5	16	58
Steers-----		0	12	8	30	50	0	12	53	4	10	60	3	10	9
Bulls-----		1	5	5	12	22	1	8	18	1	7	10	2	7	16
Horses-----		1	3	4	5	11	1	2	11	1	2	3	1	2	5

1/ BLM=Bureau of Land Management, FS=Forest Service, 0=None, S=Summer, Y=Yearlong, Sp=Spring, W=Winter, F=Fall.

2/ An animal unit is equal to the annual feed requirement of a mature 1,000-pound cow.

with a Bureau of Land Management permit only. The representative ranches having both Forest Service and Bureau of Land Management permits average 0.1 acres of cropland and pasture and 11.3 acres of rangeland per animal unit.

INVESTMENT - REPRESENTATIVE RANCHES

Investment in land of the representative ranches varies from \$5,636 to \$155,581 (table 5). This is an investment per animal unit of from \$68 to \$330. Land investment per animal unit decreases directly with the number of animal unit months of grazing permitted on Federal range. The representative ranches with Forest Service and yearlong grazing permits have the lowest per animal unit investment in land.

Investment in buildings and improvements of the representative ranches varies from \$2,515 to \$45,182. This is an investment of from \$40 to \$264 per animal unit. Buildings and improvements investment varies directly with ranch size, animal unit months in the Federal grazing permit, and the amount of cropland and pasture in the ranch. In general, investment in buildings and improvements per animal unit decreases directly with ranch size.

Investment in machinery and equipment for the representative ranches varies directly with ranch size and acreage of cropland and pasture, decreasing as ranch size increases, and increasing with cropland and pasture acreage.

The investment in livestock for the representative ranches varies between \$130 and \$160 per animal unit. This difference is primarily related to differences in the age and class composition of the livestock inventory, and to differences in livestock weights.

Total investment in land, buildings, improvements, machinery, equipment, and livestock varies among the representative ranches from \$21,280 to \$288,578. Total investment per animal unit varies from \$256 to \$722.

RELATIONSHIP OF TOTAL INVESTMENT TO THE SIZE OF THE FEDERAL GRAZING PERMIT AND THE NUMBER OF ANIMAL UNITS IN THE LIVESTOCK INVENTORY

In figure 3, average total investment per animal unit is plotted against the number of animal unit months in the Federal grazing permit per animal unit in the livestock inventory. The total investment per animal unit decreases in direct ratio to animal unit months of grazing per animal unit on Federal range. The relationship between ranch size in total animal units and total investment per animal unit is shown in figure 4. Total investment per animal unit is inversely correlated with animal unit months in the grazing permit and with ranch size.

A total investment per animal unit equation was derived from the relationships as shown in figures 3 and 4 as follows: $X_{1c} = 784.11 - 28.39 X_2 - 0.46X_3$.^{3/} As the

^{3/} X_{1c} = total investment per animal unit; X_2 = animal unit months in the grazing permit per animal unit in the livestock inventory; X_3 = ranch size in animal units.

Table 5.--Grazing permits, land in ranch and total investment of the budgeted New Mexico and Arizona cattle ranches, 1960

Range area and type 1/	Animal units	Proportion of feed obtained from Federal range	Non-Federal land		Investment--					Total investment
			Owned	Leased	Buildings and land improvements	Machinery	Live-stock			
								Owned land	Improvements	
No.	Pct.	Acres	Acres	Acres	Dol.	Dol.	Dol.	Dol.	Dol.	
Southern Intermountain										
(BLM-FWSp) (FS-S)-----	34	68	7	271	0	5,636	8,920	4,399	5,353	24,308
(BLM-Y) (FS-O)-----	35	54	0	931	0	9,031	9,425	1,678	5,329	25,283
(BLM-O) (FS-S)-----	35	29	60	115	0	10,457	2,515	3,774	4,534	21,280
(BLM-O) (FS-Y)-----	118	87	55	620	0	19,959	5,657	4,704	15,880	46,200
(BLM-O) (FS-S)-----	125	27	185	655	990	40,626	6,825	6,544	17,405	71,400
(BLM-FWSp) (FS-S)-----	210	66	18	2,677	0	26,756	22,338	12,348	32,396	93,838
(BLM-O) (FS-Y)-----	240	89	70	650	0	22,330	9,720	6,634	34,833	73,517
(BLM-Y) (FS-O)-----	247	48	0	4,525	3,937	41,358	28,283	7,735	37,649	115,025
(BLM-FWSp) (FS-S)-----	337	61	35	3,604	0	43,040	32,920	15,061	54,220	145,241
(BLM-Y) (FS-O)-----	471	31	0	15,795	4,387	155,581	45,182	10,317	77,498	288,578
(BLM-O) (FS-Y)-----	512	93	0	1,975	0	34,898	21,872	6,185	68,372	131,327
Southern Desert										
(BLM-Y) (FS-O)-----	68	55	0	1,157	733	9,603	15,311	2,828	10,746	38,488
(BLM-Y) (FS-O)-----	182	55	0	1,850	2,495	16,446	17,855	4,470	25,923	64,694
(BLM-Y) (FS-O)-----	423	52	0	4,311	6,366	38,842	38,694	7,936	63,872	149,344

1/ BLM=Bureau of Land Management, FS=Forest Service, 0=None, S=Summer, Y=Yearlong, Sp=Spring, W=Winter, F=Fall.

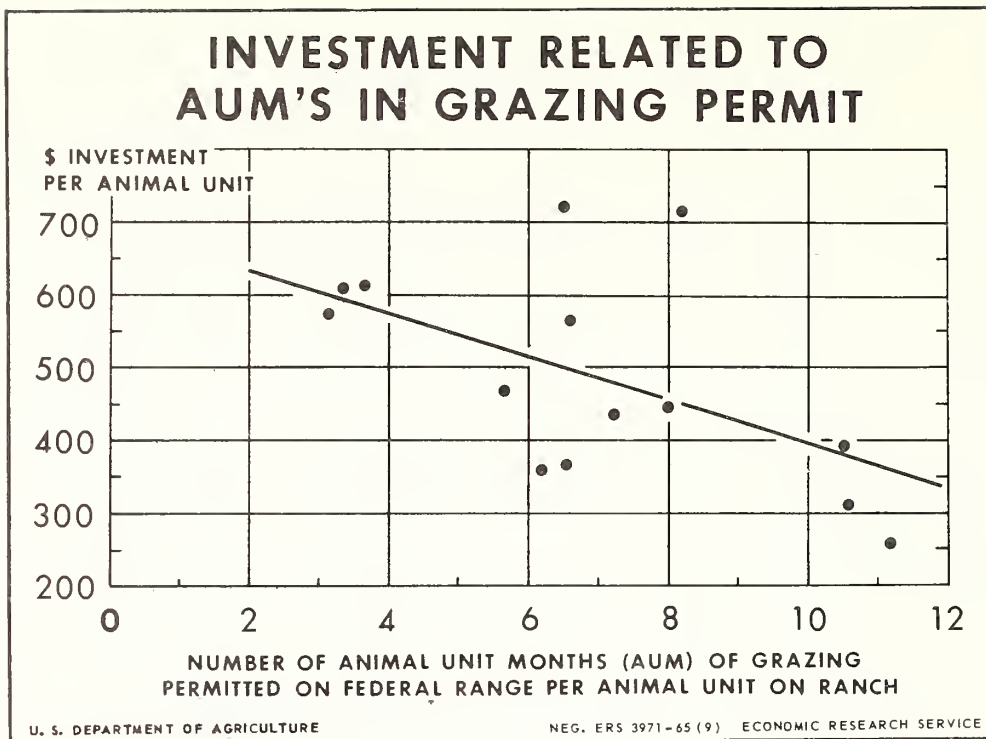


Figure 3

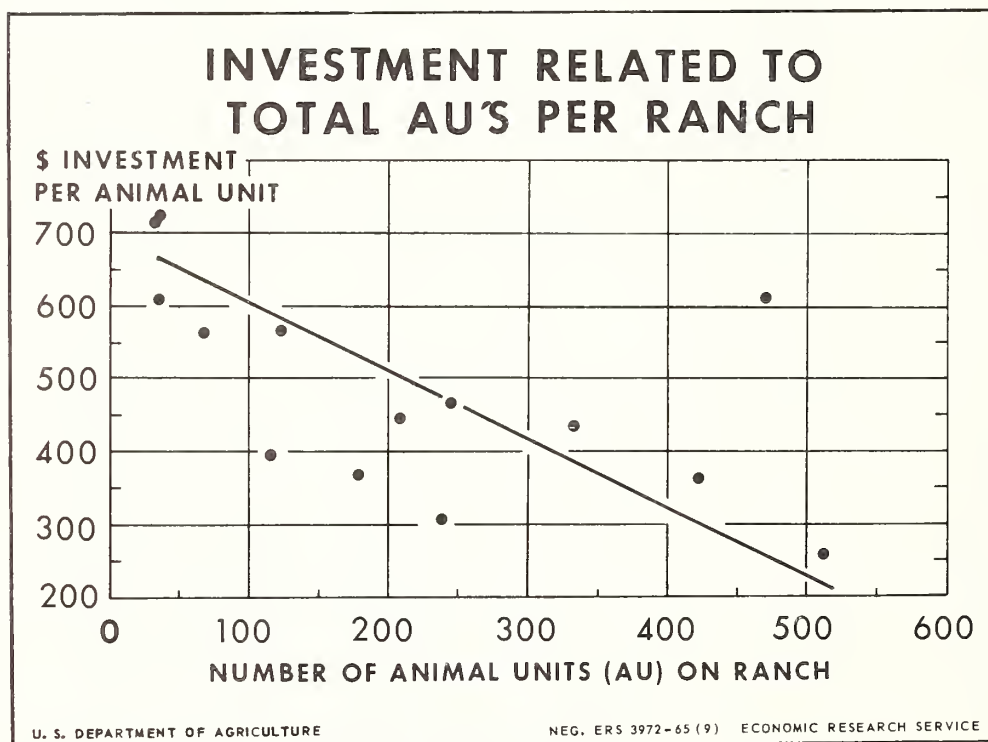


Figure 4

ratio of the number of animal unit months of grazing on the Federal range to the number of animal units in the livestock inventory (X_2) increases one animal unit month, the average investment per animal unit decreases by \$28. Also, as the average number of cattle in the inventory (X_3) increases one animal unit, average investment per animal unit decreases by \$0.46 (\$46 per 100 head). These relationships indicate that as ranch size (X_3) approaches 512 animal units (the largest representative ranch in the study), investment per animal unit might be as little as \$350.43. On the average size ranch (217 animal units), if the average animal unit months in the grazing permit is as much as the observed maximum (11.2 animal unit months), total investment per animal unit might be as little as \$366.21.

LIVESTOCK PRODUCTION RATES

Differences in production rates such as calf crops, death losses, and average livestock weights, depend upon climatic and physical factors affecting forage production, as well as forage utilization practices, supplemental feeding programs, and times of marketing. Net production per animal unit of the representative ranches varies directly with ranch location and ranch size (table 6), and generally increases as the size of the ranch increases or as the ranch location becomes more favorable. The larger ranches and the Forest Service permit ranches have the highest production per animal unit.

PRODUCTION COSTS

Cash Costs

Supplemental feed, hired labor, fuel and oil, taxes, and grazing fees comprise about 70 percent of total cash costs (table 7). On an animal unit basis, average cash costs decrease with ranch size from \$42 on the smaller ranches to \$29 on the larger (table 8). Cash costs per pound of livestock sold also decrease with ranch size (table 9); they vary among representative ranches because of differences in winter feeding programs and the proportion of Federal range grazing and fees charged for this grazing.

Noncash Costs

The noncash costs consist of depreciation and death loss on purchased livestock, and an allowance for operator and family labor (table 7). Depreciation costs per animal unit generally decrease with ranch size, varying from an average of \$34 on the smallest ranches to \$12 on the largest (table 8). The comparable costs per pound of beef sold are 11.8 cents and 3.97 cents for small and large ranches (table 9). For comparable size ranches depreciation costs varied with duration of the grazing permit on Federal range and with the amount of crop and hayland owned. There was little variation in labor costs among ranches of similar sizes, except that more operator and family labor was required on ranches with base properties that included cropland and pasture.

Total operator and family labor costs vary directly with ranch size; however, these labor costs per animal unit decrease with ranch size. Labor costs per animal unit average \$47 for the smaller ranches and \$5 for the larger ranches (table 8).

Table 6.--Net beef production per animal unit by ranch size and ranch size group, representative cattle ranches, Southern Intermountain and Southern Desert Ranching Areas, 1960

Grazing permit type and ranch location <u>1/</u>	Animal units	Annual calf crop <u>2/</u>	Annual death loss <u>3/</u>	Annual cow herd replace- ment rate <u>4/</u>	Net beef production per animal unit
	Number	Percent	Percent	Percent	Pounds
SI-(BLM-FWSp) (FS-S)---	34	92.0	9.4	12.0	290
SI-(BLM-0) (FS-S)-----	35	75.9	3.4	14.0	286
SI-(BLM-Y) (FS-0)-----	35	85.7	6.2	16.0	286
Average-----	34.7	84.5	6.3	14.0	287
SD-(BLM-Y) (FS-0)-----	68	76.4	3.2	9.1	255
SI-(BLM-0) (FS-Y)-----	118	77.8	2.8	16.5	292
SI-(BLM-0) (FS-S)-----	125	77.6	2.0	17.8	313
Average-----	103.7	77.3	2.7	14.5	287
SD-(BLM-Y) (FS-0)-----	182	83.8	3.1	10.3	273
SI-(BLM-FWSp) (FS-S)---	210	84.4	4.2	13.1	290
SI-(BLM-0) (FS-Y)-----	240	77.6	2.6	20.2	319
SI-(BLM-Y) (FS-0)-----	247	81.6	2.6	12.2	293
Average-----	219.8	81.8	3.1	14.0	294
SI-(BLM-FWSp) (FS-S)---	337	82.6	2.7	14.0	308
SD-(BLM-Y) (FS-0)-----	423	81.1	2.4	18.6	278
Average-----	380.0	81.8	2.6	16.3	293
SI-(BLM-Y) (FS-0)-----	471	84.9	2.2	15.9	305
SI-(BLM-0) (FS-Y)-----	512	77.5	2.8	17.4	296
Average-----	491.5	81.2	2.5	16.6	300
Average-----	216.9	81.3	3.4	15.1	292

1/ SI=Southern Intermountain Ranching Area, SD=Southern Desert Ranching Area, BLM=Bureau of Land Management, FS=Forest Service, 0=None, S=Summer, Y=Yearlong, Sp=Spring, W=Winter, F=Fall.

2/ Calves produced during the year net of death losses, divided by total cows and 2-year-old heifers in the livestock inventory January 1.

3/ Cattle died exclusive of calves divided by number of cows and 2-year-old heifers on hand January 1.

4/ Heifers selected from the annual calf crop to replace aged cows sold and mature cows that have died.

Table 7.--Total income and costs, and rate of return on investment, representative cattle ranches, 1960

Grazing permit type and ranch location 1/	Animal units	Gross income 2/	Cash cost 3/	Depreci- ation 3/	Operator and family labor	Total cost	Net cash ranch income	Net ranch income 4/	Rate of return on investment
	No.	Dol.	Dol.	Dol.	Dol.	Dol.	Dol.	Dol.	Pct.
SI-(BLM-FWSp) (FS-S)-----	34	1,851	1,438	1,430	1,116	3,984	413	-1,017	-4.18
SI-(BLM-O) (FS-S)-----	35	2,014	1,447	885	2,628	4,960	567	-318	-1.49
SI-(BLM-Y) (FS-O)-----	35	1,888	1,487	1,225	1,116	3,828	401	-824	-3.26
SD-(BLM-Y) (FS-O)-----	68	3,288	2,430	2,102	1,488	6,020	858	-1,244	-3.23
SI-(BLM-O) (FS-Y)-----	118	6,790	5,079	1,546	2,628	9,253	1,711	165	.36
SI-(BLM-O) (FS-S)-----	125	7,546	4,942	1,659	2,628	9,229	2,604	945	1.32
SD-(BLM-Y) (FS-O)-----	182	9,808	4,947	3,147	2,232	10,326	4,861	1,714	2.65
SI-(BLM-FWSp) (FS-S)-----	210	11,965	5,685	4,012	2,232	11,929	6,280	2,268	2.42
SI-(BLM-O) (FS-Y)-----	240	14,663	8,752	2,365	2,628	13,745	5,911	3,546	4.82
SI-(BLM-Y) (FS-O)-----	247	13,483	6,723	4,010	2,232	12,965	6,760	2,750	2.39
SI-(BLM-FWSp) (FS-S)-----	337	19,087	9,621	6,214	2,232	18,067	9,466	3,252	2.24
SD-(BLM-Y) (FS-O)-----	423	21,193	12,150	5,802	2,232	20,184	9,043	3,240	2.17
SI-(BLM-Y) (FS-O)-----	471	28,246	13,544	7,730	2,232	23,506	14,702	6,972	2.42
SI-(BLM-O) (FS-Y)-----	512	29,431	17,406	3,994	2,628	24,028	12,025	8,031	6.12

1/ SI=Southern Intermountain Ranching Area, SD=Southern Desert Ranching Area, BLM=Bureau of Land Management, FS=Forest Service, O=None, S=Summer, Y=Yearlong, Sp=Spring, W=Winter, F=Fall.

2/ Income at projected prices for livestock and crops.

3/ Includes depreciation on equipment, buildings, and purchased livestock.

4/ Net ranch income: Gross receipts less cash cost and depreciation.

Table 8.--Relation of ranch income and costs per animal unit to ranch size, representative cattle ranches, Southern Intermountain and Southern Desert Ranching Areas, 1960 ^{1/}

Grazing permit type and ranch location ^{2/}	Animal units	Gross income per animal unit	Cost per animal unit				Net income per animal unit	
			Cash cost	Depreci- ation	Operator and family labor	Total cost	Net cash income	Net ranch income ^{3/}
	No.	Dol.	Dol.	Dol.	Dol.	Dol.	Dol.	Dol.
SI-(BLM-FWSp) (FS-S)-----	34	54	42	42	33	117	12	-30
SI-(BLM-0) (FS-S)-----	35	58	41	25	75	141	17	-8
SI-(BLM-Y) (FS-0)-----	35	54	42	35	32	109	12	-23
Average-----	---	55	42	34	47	123	13	-21
SD-(BLM-Y) (FS-0)-----	68	48	36	31	22	89	12	-19
SI-(BLM-0) (FS-Y)-----	118	58	43	13	22	78	15	2
SI-(BLM-0) (FS-S)-----	125	60	40	13	21	74	20	7
Average-----	---	57	40	17	22	79	17	0
SD-(BLM-Y) (FS-0)-----	182	54	27	17	12	56	27	10
SI-(BLM-FWSp) (FS-S)-----	210	57	27	19	11	57	30	11
SI-(BLM-0) (FS-Y)-----	240	61	36	10	11	57	25	15
SI-(BLM-Y) (FS-0)-----	247	54	27	16	9	52	27	11
Average-----	---	57	30	15	11	56	27	12
SI-(BLM-FWSp) (FS-S)-----	337	57	28	18	7	53	29	11
SD-(BLM-Y) (FS-0)-----	423	50	29	14	5	48	21	7
Average-----	---	53	29	16	6	51	24	8
SI-(BLM-Y) (FS-0)-----	471	60	29	16	5	50	31	15
SI-(BLM-0) (FS-Y)-----	512	57	34	8	5	47	23	15
Average-----	---	59	32	12	5	49	27	15

^{1/} Sale value or gross income was calculated on the basis of 1960 costs and on projected prices for livestock.

^{2/} SI=Southern Intermountain Ranching Area, SD=Southern Desert Ranching Area, BLM=Bureau of Land Management, FS=Forest Service, 0=None, S=Summer, Y=Yearlong, Sp=Spring, W=Winter, F=Fall.

^{3/} Sales less cash costs, depreciation, and death loss of purchased livestock.

Table 9.--Cash, noncash, and total cost of production per pound sold, by ranch size, representative ranches, Southern Intermountain and Southern Desert Ranching Areas, 1960

Grazing permit type and ranch location <u>1/</u>	Animal units	Cost per pound of beef sold			
		Cash	Depreci- ation and death loss	Operator and family labor	Total cash and noncash cost
	<u>Number</u>	<u>Cents</u>	<u>Cents</u>	<u>Cents</u>	<u>Cents</u>
SI-(BLM-FWSp) (FS-S)-----	34	14.55	14.48	11.30	40.33
SI-(BLM-0) (FS-S)-----	35	14.47	8.85	26.28	49.60
SI-(BLM-Y) (FS-0)-----	35	14.86	12.24	11.15	38.25
Average-----	---	14.63	11.84	16.26	42.73
SD-(BLM-Y) (FS-0)-----	68	14.03	12.14	8.59	34.76
SI-(BLM-0) (FS-Y)-----	118	14.73	4.48	7.62	26.83
SI-(BLM-0) (FS-S)-----	125	12.65	4.25	6.72	23.62
Average-----	---	13.81	5.84	7.42	27.07
SD-(BLM-Y) (FS-0)-----	182	9.95	6.33	4.49	20.77
SI-(BLM-FWSp) (FS-S)-----	210	9.35	6.60	3.67	19.62
SI-(BLM-0) (FS-Y)-----	240	11.43	3.09	3.43	17.95
SI-(BLM-Y) (FS-0)-----	247	9.30	5.55	3.09	17.94
Average-----	---	10.07	5.22	3.59	18.88
SI-(BLM-FWSp) (FS-S)-----	337	9.26	5.98	2.15	17.39
SD-(BLM-Y) (FS-0)-----	423	10.34	4.94	1.90	17.18
Average-----	---	9.84	5.43	2.02	17.29
SI-(BLM-Y) (FS-0)-----	471	9.42	5.38	1.55	16.35
SI-(BLM-0) (FS-Y)-----	512	11.48	2.63	1.73	15.84
Average-----	---	10.48	3.97	1.65	16.10

1/ SI=Southern Intermountain Ranching Area, SD=Southern Desert Ranching Area, BLM=Bureau of Land Management, FS=Forest Service, 0=None, S=Summer, Y=Yearlong, Sp=Spring, W=Winter, F=Fall.

This range of labor costs represents a cost of 16.3 cents per pound of beef produced for the smaller ranches as compared to 1.7 cents for the larger ranches. Labor costs per animal unit are quite similar for ranches of about the same size.

Total Cost

Cash and noncash costs of the representative ranches range from \$3,828 for a 35-animal-unit ranch to a high of \$24,027 for a 512-animal-unit ranch. Total costs per animal unit average \$123 for the smaller ranches and \$49 for the larger (tables 8 and 9). Among the representative ranches total costs per animal unit are related to ranch size, costs per animal unit month of Federal range grazing, and the acreage of crop and hayland on the ranch.

RANCH INCOME

Gross income per animal unit varies only slightly among the representative ranches; the differences in gross income are due to differences in productivity per animal unit and to price differentials by ranch location (table 7). Gross income per animal unit in the livestock inventory averages from \$53 to \$59 and varies only slightly among the representative ranches (table 8).

Ranch income net of cash costs increases with ranch size as a result of the decrease in cash costs per animal unit as size increases. The main decreases in cash costs per animal unit are associated with land taxes, hired labor, and machine operating costs. Ranch income net of cash costs per animal unit varies from an average of \$13 for the smaller ranches to an average of \$27 per animal unit for the larger ranches (table 8). Because of differences in productivity by ranch location, the ranches at higher elevations received more income net of cash costs than did other ranches.

Ranches with fewer than 68 animal units in size have a negative net ranch income (table 7). Net ranch income per animal unit increases with ranch size, ranging from an average of \$-21 for the smaller ranches to \$15 for the larger ranches (table 8). Net ranch incomes are similar among ranches of a similar size regardless of location or type of grazing permit.

Rates of Return on Investment

The rate of return on investment ^{4/} varies from -4.18 percent for the 35-animal-unit ranch in the Southern Intermountain Ranching Area to 6.12 percent for the 512-animal-unit ranch (table 7). Rates of return are highest for ranches with the highest productivity per animal unit, the largest size, and the lowest total investment per animal unit.

^{4/} Net ranch income, including returns to operator and family labor, divided by total investment.

SHORT-RUN COST AND INCOME EFFECTS OF CHANGES IN LIVESTOCK PRICES, RANGE FORAGE SUPPLIES, AND FEDERAL RANGE GRAZING FEES AND PERMITS

Changes in Livestock Prices

Average prices received for cattle in 1953-60, which were slightly higher than the projected prices, were used to show the effect of a price increase on net ranch income. The average price received for cattle was 19.10 cents per pound using projected prices while the 1953-60 average price was 19.80 cents per pound (table 10). Although this price increase was very slight, it increased the average gross income of the 14 representative ranches by 3.69 percent. Consequently, average net ranch income at 1953-60 average prices was \$2,563 as compared with \$2,105 at the projected prices, an average increase of approximately 22 percent.

The break-even points between costs and returns at projected prices and 1953-60 average prices are shown in figure 5. The break-even points occur at a ranch size of about 110 animal units for the projected price level and about 100 animal units for the 1953-60 average price level.

Changes in Grazing Fees

Grazing fees are increased from 1960 average fees of 20 cents (Bureau of Land Management) and 60 cents (Forest Service) by four 20-cent increments per animal unit month to determine the cost effect on net ranch income.^{5/} The fee increases are applied simultaneously against 1960 fee levels of both Federal agencies. Each 20-cent grazing fee increase raises average cash costs by \$325 to a total cash cost increase averaging \$1,300 (table 11). The increases in cash costs are directly related to the number of animal unit months permitted. Besides reducing the amount of net ranch income, the first 20-cent increase in grazing fees changed the net ranch income of an additional ranch from positive to negative (table 12).

Changes in Range Forage Supplies

Five of the ranches, each representing a typical ranching situation in either the Southern Intermountain Area or the Southern Desert Ranching Area, were selected to evaluate the cost and income effect of an increase and a decrease in range forage. The forage available to these ranches was assumed to vary from normal by 20 percent. Livestock inventory numbers and supplemental feeding practices were changed as required with the reduction and the increase in forage, and livestock prices were held constant. The cost and income evaluations of the effect on net ranch income of a 20-percent increase or decrease in forage were made under two conditions with regard to the Federal range grazing permit. The grazing permit was first held constant and then it was increased or decreased as range forage was permitted to increase or decrease.

^{5/} The highest fee level evaluated was \$1.00 per animal unit month for Bureau of Land Management grazing and \$1.40 per animal unit month for Forest Service grazing.

Table 10.--Effect of a price change on gross ranch income of the representative cattle ranches using projected prices and 1953-60 average prices

Grazing permit type and ranch location 1/	Animal units	Estimated cattle prices per cwt:		Gross income at--		Absolute and relative dif- ference in gross income using projected prices and 1953-60 average prices	
		1953-60 average prices :		1953-60 average prices :			
		Dol.	Dol.	Dol.	Dol.		Pct.
SI-(BLM-FWSp) (FS-S)----	34	18.73	19.70	1,851	1,946	95	5.13
SI-(BLM-0) (FS-S)-----	35	20.14	20.61	2,014	2,061	47	2.33
SI-(BLM-Y) (FS-0)-----	35	18.87	19.88	1,888	1,990	102	5.40
Average-----	---	19.25	20.06	1,918	1,999	81	4.22
SD-(BLM-Y) (FS-0)-----	68	18.99	20.00	3,288	3,463	175	5.32
SI-(BLM-0) (FS-Y)-----	118	19.69	19.92	6,790	6,868	78	1.15
SI-(BLM-0) (FS-S)-----	125	19.31	19.63	7,546	7,671	125	1.66
Average-----	---	19.39	19.81	5,875	6,001	126	2.14
SD-(BLM-Y) (FS-0)-----	182	19.74	20.79	9,808	10,332	524	5.34
SI-(BLM-FWSp) (FS-S)----	210	19.67	20.72	11,965	12,605	640	5.35
SI-(BLM-0) (FS-Y)-----	240	19.13	19.29	14,663	14,786	123	.84
SI-(BLM-Y) (FS-0)-----	247	18.67	19.69	13,483	14,219	736	5.46
Average-----	---	19.24	20.02	12,480	12,986	506	4.05
SI-(BLM-FWSp) (FS-S)----	337	18.37	19.32	19,087	20,075	988	5.18
SD-(BLM-Y) (FS-0)-----	423	18.04	18.81	21,193	22,096	903	4.26
Average-----	---	18.20	19.05	20,140	21,086	946	4.70
SI-(BLM-Y) (FS-0)-----	471	19.66	20.66	28,246	29,686	1,440	5.10
SI-(BLM-0) (FS-Y)-----	512	19.42	19.64	29,431	29,770	339	1.15
Average-----	---	19.53	20.13	28,839	29,728	889	3.08
Average-----	---	19.10	19.80	12,232	12,683	451	3.69

1/ SI=Southern Intermountain Ranching Area, SD=Southern Desert Ranching Area, BLM=Bureau of Land Management, FS=Forest Service, 0=None, S=Summer, Y=Yearlong, SP=Spring, W=Winter, F=Fall.

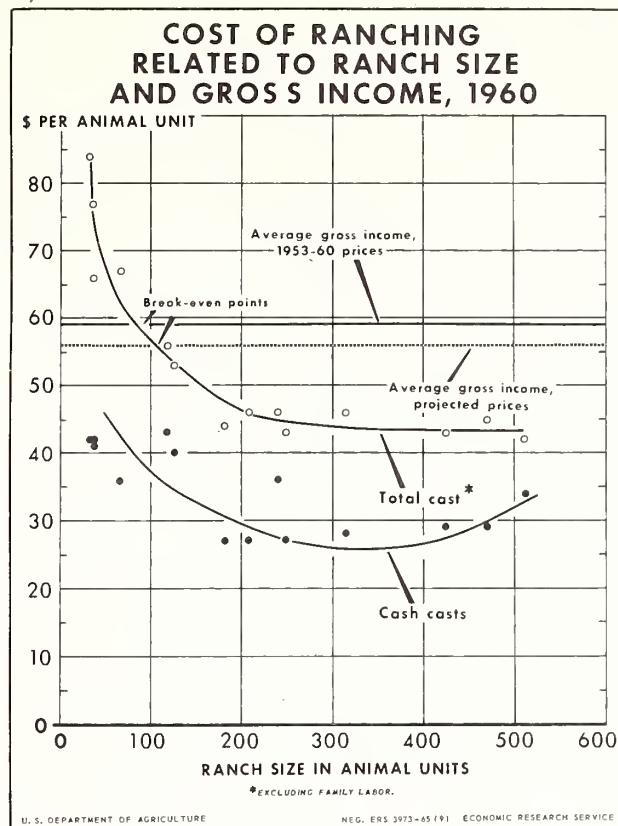


Figure 5

Table 11.--Increase in cash cost on representative cattle ranches associated with four 20-cent increases in Federal range grazing fees 1/

Grazing permit type and ranch location <u>2/</u>	Animal units	AUM's in grazing permit	Net increase in cash cost with grazing fees at--			
			0.40/0.80 ^{3/}	0.60/1.00	0.80/1.20	1.00/1.40
	Number	Number	Dollars	Dollars	Dollars	Dollars
SI-(BLM-FWSp) (FS-S)-----	34	277	57	114	171	228
SI-(BLM-O) (FS-S)-----	35	120	25	49	74	99
SI-(BLM-Y) (FS-O)-----	35	226	46	93	140	185
SD-(BLM-Y) (FS-O)-----	68	452	93	186	279	373
SI-(BLM-O) (FS-Y)-----	118	1,236	254	509	764	1,019
SI-(BLM-O) (FS-S)-----	125	400	82	165	247	330
SD-(BLM-Y) (FS-O)-----	182	1,208	249	497	747	995
SI-(BLM-FWSp) (FS-S)-----	210	1,673	345	689	1,034	1,378
SI-(BLM-O) (FS-Y)-----	240	2,556	526	1,053	1,580	2,106
SI-(BLM-Y) (FS-O)-----	247	1,413	291	582	873	1,164
SI-(BLM-FWSp) (FS-S)-----	337	2,461	507	1,014	1,521	2,028
SD-(BLM-Y) (FS-O)-----	423	2,631	542	1,084	1,626	2,168
SI-(BLM-Y) (FS-O)-----	471	1,728	356	712	1,068	1,423
SI-(BLM-O) (FS-Y)-----	512	5,724	1,179	2,359	3,537	4,716
Average-----	---	---	325	650	975	1,300

1/ Added cash cost includes an interest charge of 6 percent for 6 months.

2/ SI=Southern Intermountain Ranging Area, SD=Southern Desert Ranging Area, BLM=Bureau of Land Management, FS=Forest Service, O=None, S=Summer, Y=Yearlong, Sp=Spring, W=Winter, F=Fall.

3/ 40 cents per AUM for Bureau of Land Management and 80 cents per AUM for Forest Service grazing, etc.

Table 12.--Net ranch income of the representative cattle ranches at each of five Federal grazing fee levels starting with 1960 average fees and increasing 1960 average fees by four 20-cent increments per animal unit month 1/

Grazing permit type and ranch location 2/	AUM's in:		Net ranch income with fees at--				
	Animal:	grazing:	0.20/0.603/0.40/0.800.60/1.000.80/1.201.00/1.40				
	units:	permit:	Dollars	Dollars	Dollars	Dollars	Dollars
<u>Southern Intermountain</u>							
(BLM-FWSp) (FS-S)-----	34	277	-1,017	-1,074	-1,131	-1,188	-1,245
(BLM-Y) (FS-0)-----	35	226	-824	-870	-917	-964	-1,009
(BLM-0) (FS-S)-----	35	120	-318	-343	-367	-392	-417
(BLM-0) (FS-Y)-----	118	1,236	165	-89	-344	-599	-854
(BLM-0) (FS-S)-----	125	400	945	863	780	698	615
(BLM-FWSp) (FS-S)-----	210	1,673	2,268	1,923	1,579	1,234	890
(BLM-0) (FS-Y)-----	240	2,556	3,546	3,020	2,493	1,966	1,440
(BLM-Y) (FS-0)-----	247	1,413	2,750	2,459	2,168	1,877	1,586
(BLM-FWSp) (FS-S)-----	337	2,461	3,252	2,745	2,238	1,731	1,224
(BLM-Y) (FS-0)-----	471	1,728	6,972	6,616	6,260	5,904	5,549
(BLM-0) (FS-Y)-----	512	5,724	8,031	6,852	5,672	4,494	3,315
<u>Southern Desert</u>							
(BLM-Y) (FS-0)-----	68	452	-1,244	-1,337	-1,430	-1,523	-1,618
(BLM-Y) (FS-0)-----	182	1,208	1,714	1,465	1,217	967	719
(BLM-Y) (FS-0)-----	423	2,631	3,240	2,698	2,156	1,614	1,072

1/ Projected prices received for cattle; 1960 prices paid.

2/ BLM=Bureau of Land Management, FS=Forest Service, 0=None, S=Summer, Y=Yearlong, Sp=Spring, W=Winter, F=Fall.

3/ 20 cents per AUM for Bureau of Land Management grazing and 60 cents per AUM for Forest Service grazing.

Adjustments were made in livestock and grazing management in accordance with the findings of a drought adjustment study in New Mexico.^{6/}

A 20-percent decrease in forage with no change in the grazing permit increases cash costs 7 percent. A 20-percent increase in forage increases cash costs 4 percent (table 13). Net cash income increases an average of 14 percent and decreases an average of 14 percent with the 20-percent increase or decrease in range forage. If the Federal range grazing permit also increases or decreases proportionally with changes in forage, net cash income will increase 25 percent or decrease 22 percent (table 14).

Reduction in the Federal Range Grazing Permit

An animal unit month reduction of 20 percent in the Federal range grazing permit, with only reductions in the livestock inventory being considered, resulted in a reduction in gross ranch income of 11 percent and a reduction in cash costs of 10 percent (table 15).^{7/} With these adjustments, net cash income of the five ranches was reduced an average of 12 percent.

LONG-RUN COST AND INCOME EFFECTS OF CHANGES IN LIVESTOCK PRICES, RANGE FORAGE SUPPLIES, AND FEDERAL GRAZING FEES AND PERMITS

In the long run the short-run losses in ranch income may be offset by investment in additional land or range improvement and similar opportunities. Whether these opportunities are profitable will depend upon the additional costs and the addition to range forage supply.^{8/}

If profitable adjustments are not possible, in the long run eventual reduction in the capital structure of the ranch will occur. For example, if the average reduction in net ranch income of the 14 representative ranches were caused by a 20-cent

^{6/} Boykin, C. C., Gray, J. R., and Caton, D. D. Ranch Production Adjustments to Drought in Eastern New Mexico. N. Mex. Agr. Expt. Sta. Bul. 470, Dec. 1962.

^{7/} Ranch production adjustments with a reduction in the Federal range grazing permit, such as leasing additional rangeland, improving rangeland, or buying additional feed, were not considered. Therefore the livestock inventory was reduced 12 percent.

^{8/} Pingrey, Hazen B., and Dortignac, E. J. Economic Evaluation of Seeded Crested Wheatgrass on Northern New Mexico Rangeland. N. Mex. Agr. Expt. Sta. Bul. 443, Feb. 1959.

Pingrey, Hazen B., and Dortignac, E. J. Cost of Seeding Northern New Mexico Rangelands. N. Mex. Agr. Expt. Sta. Bul. 413, 1958.

Caton, D. C., McCorkle, C. O., Jr., and Upchurch, M. L. Economics of Range Improvement on Western Grazing Lands. Jour. Range Management, Vol. 13, No. 3. 1960.

Table 13.--Estimated cash costs and net cash income of 5 of the budgeted cattle ranches with a 20-percent increase or a 20-percent decrease in range forage supplies and with no change in the amount of feed furnished by the Federal grazing permit

Grazing permit type and ranch location: 1/	Animal units	Previous cash:			Cost and income changes associated with a 20-percent decrease in range forage			Cost and income changes associated with a 20-percent increase in range forage		
		Cash cost	Net cash income	Change in net cash income	Cash cost	Net cash income	Change in net cash income	Cash cost	Net cash income	Change in net cash income
No.		Dol.	Dol.	Dol.	Dol.	Dol.	Dol.	Dol.	Dol.	Dol.
Southern Intermountain										
(BLM-0) (FS-S)	125	4,942	2,604	5,052	2,241	+110	-363	5,204	3,049	+262
(BLM-0) (FS-Y)	240	8,752	5,911	9,094	4,993	+342	-918	8,875	6,438	+123
(BLM-Y) (FS-0)	247	6,723	6,760	7,534	5,723	+811	1,037	7,098	7,703	+375
(BLM-FWSp) (FS-S)	210	5,685	6,280	6,041	5,839	+356	-441	6,035	7,485	+350
Southern Desert										
(BLM-Y) (FS-0)	182	4,947	4,861	5,628	3,988	+681	-873	5,155	5,488	+208
Average	---	6,210	5,283	6,670	4,557	+460	-726	6,473	6,033	+263
Average percentage change	---	---	---	---	---	+7	-14	---	---	+4
	---	---	---	---	---	---	---	---	---	+14

1/ BLM=Bureau of Land Management, FS=Forest Service, 0=None, S=Summer, Y=Yearlong, Sp=Spring, W=Winter, F=Fall.

Table 14.--Estimated cash costs and net cash income of 5 of the budgeted cattle ranches with a 20-percent increase or a 20-percent decrease in both private and Federal range forage supplies

Grazing permit type: and ranch location: 1/	Animal units	Previous cash:			Cost and income changes associated with a 20-percent decrease in range forage			Cost and income changes associated with a 20-percent increase in range forage		
		Cash cost	Net cash income		Cash cost	Net cash income		Cash cost	Net cash income	
	No.	<u>Dol.</u>	<u>Dol.</u>	<u>Dol.</u>	<u>Dol.</u>	<u>Dol.</u>	<u>Dol.</u>	<u>Dol.</u>	<u>Dol.</u>	<u>Dol.</u>
Southern Intermountain										
(BLM-0) (FS-S)-----	125	4,942	2,604	5,002	1,856	+60	-748	5,444	3,401	+502
(BLM-0) (FS-Y)-----	240	8,752	5,911	8,529	4,633	-223	1,278	10,073	7,124	+1,321
(BLM-Y) (FS-0)-----	247	6,723	6,760	7,163	5,220	+440	-1,540	7,592	8,634	+869
(BLM-FWSp) (FS-S)---	210	5,685	6,280	5,737	5,262	+52	-1,018	6,362	7,715	+677
Southern Desert										
(BLM-Y) (FS-0)-----	182	4,947	4,861	5,084	3,650	+137	-1,211	5,540	6,106	+593
Average-----	---	6,210	5,283	6,303	4,124	+93	-1,159	7,002	6,596	+792
				Pct.			Pct.			Pct.
Average per- centage change-----		---	---	---	---	+1	-22	---	---	+13
										+25

1/ BLM=Bureau of Land Management, FS=Forest Service, 0=None, S=Summer, Y=Yearlong, Sp=Spring, W=Winter, F=Fall.

Table 15.--Estimated effect on costs and net ranch income of selected ranches with a 20-percent reduction in the AUM's permitted on Federal range

Grazing permit type and ranch location 1/	AUM's in		Gross ranch income		Cash costs	
	grazing permit					
	Animal units	Prior to adjust- ment	After adjust- ment	From origi- nal budget 2/	Adjusted 3/ From origi- nal budget 2/	Adjusted 3/
	No.	No.	No.	Do1.	Do1.	Do1.
<u>Southern Intermountain</u>						
(BLM-0) (FS-S)-----	125	400	320	7,546	6,933	4,774
(BLM-0) (FS-Y)-----	240	2,556	2,045	14,663	12,035	8,752
(BLM-Y) (FS-0)-----	247	1,413	1,130	13,483	12,771	6,723
(BLM-FWSp) (FS-S)-----	210	1,673	1,338	11,965	10,448	5,685
<u>Southern Desert</u>						
(BLM-Y) (FS-0)-----	182	1,208	966	9,808	8,805	4,947
Average-----	---	---	---	11,493	10,198	6,210
Average percent- age change-----	---	---	---	Pct.	Pct.	Pct.
				-11	---	-10

1/ BLM=Bureau of Land Management, FS=Forest Service, 0=None, S=Summer, Y=Yearlong, Sp=Spring, W=Winter, F=Fall.

2/ See table 7, page 13.

3/ Caused by a reduction in the number of animal units in the livestock inventory.

increase on 1960 average grazing fees, with livestock prices and production being constant, average ranch capital value could be reduced by \$6,500. The average reduction in net ranch income capitalized at five percent is \$325. A 20-percent reduction in the grazing permit, under the same assumptions, would reduce by \$13,120 the average capital value of the five representative ranches to which the permit reduction was applied. This is the average reduction of net ranch income of \$656 capitalized at five percent.

Summary and Conclusions

The purpose of this study was to evaluate the economic effects of alternative levels of livestock prices, range forage supplies, grazing fees, and grazing permits on the organization and net income of representative types and sizes of cattle ranches that use Federal grazing lands in the Southern Intermountain and Southern Desert Ranching Areas of Arizona and New Mexico.

The representative ranches vary in size from 34 animal units to 512 animal units with a total investment per animal unit of from \$256 to \$722. These representative ranches have average costs, including cash costs, depreciation, and an allowance for operator and family labor, of \$49 per animal unit, and an average net income of \$15 per animal unit. About half of the ranches do not cover the computed total costs, and four of the ranches do not cover total costs exclusive of the allowance for operator and family labor. Ranches of more than 100 animal units in size are estimated to have positive net incomes. A slight change in livestock prices has a more than proportionate effect on the number of animal units necessary to cover costs.

The cost and income effects of changes in Federal range grazing fees and grazing permits were evaluated for a selected number of the representative ranches. Under the assumptions of the study, each 20-cent increase from the 1960 average grazing fee levels would reduce net ranch income an average of \$325. A reduction of 20 percent in the grazing permit would reduce net ranch income an average of \$656. A 20-percent decrease in range forage supply could reduce net ranch income up to an average of 22 percent. With no changes in livestock prices or production these reductions in net ranch income could, over time, reduce the capital value of the representative ranches.

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